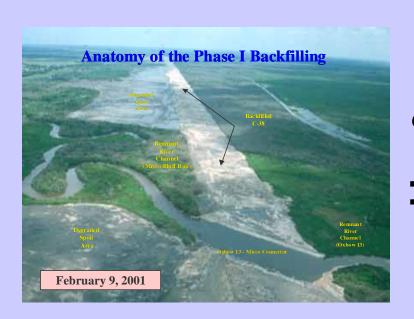
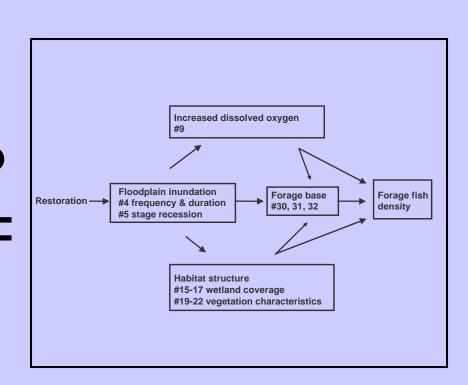
Restoring the Kissimmee River: A Successful Evaluation Program Kissimmee River Restoration Project (KRRP)



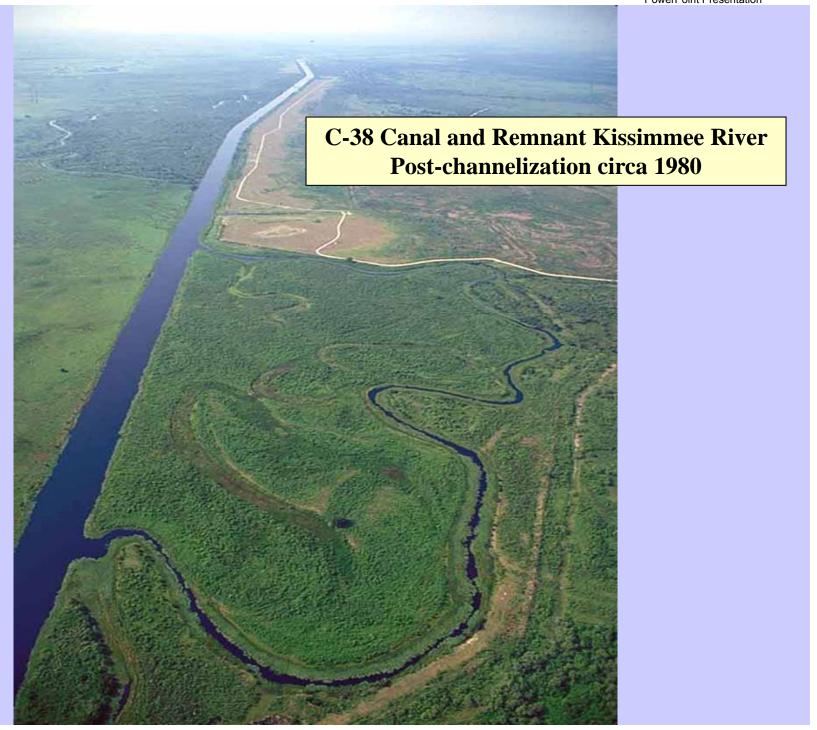
Restoration of the Kissimmee River.



Applying restoration expectations.











Simple Conceptual Model

Restoration ---- Abjotic **Biotic**

Flow

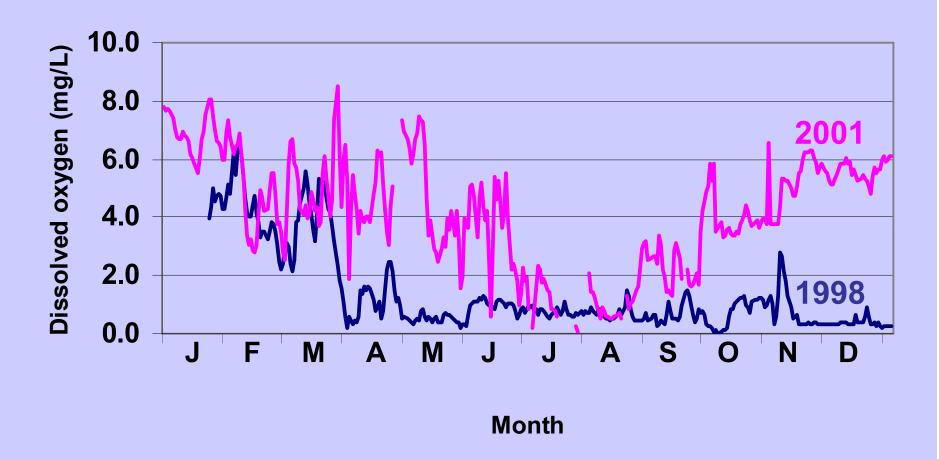
Substratum Geomorphic

Hydrologic

Dissolved Oxygen

Hydroperiod

Algae **Plants** Invertebrates **Fish Amphibians Birds**



Dissolved Oxygen (1 m) before (1998) and after (late 2001) restoration

60 Restoration Expectations (Metrics)

- Hydrology 6
- Geomorphology 2
- Water Quality 4
- Vegetation 10
- Invertebrates 11

- Algae 2
- Amphibians 2
- Fish 7
 - Birds 11
 - Listed Species 5

Expectations linked to an experimental design, location and frequency of measurements, methods to be used, and ways to analyze and report the resulting data.

Short Summary - KRRP

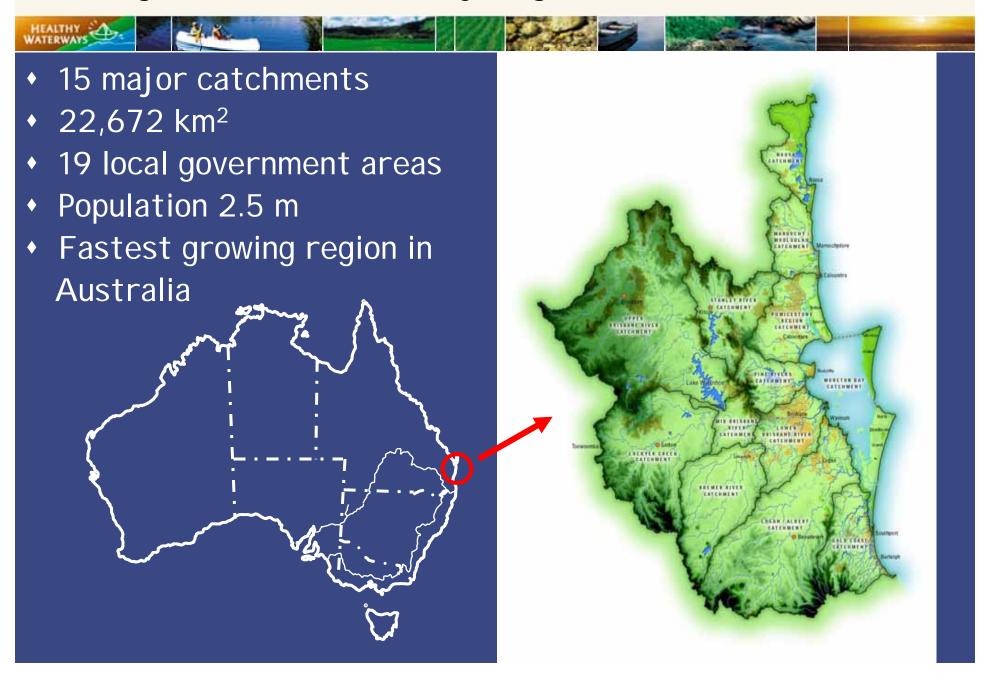
- Completed Phase I of Restoration
- So far strong positive changes in
 - River channel and wetland vegetation
 - Shore birds and overwintering birds
 - Fish communities
 - Substratum and spawning beds
 - Dissolved oxygen
- Evaluating success with clear expectations and metrics for a decade

Healthy Waterways Initiative - Southeast Queensland



- Study region: Moreton Bay catchments in eastern Australia - most rapidly expanding population in Australia - Brisbane area
- Development of partnership (science, managers, policy makers) to deal with issues affecting rivers and coastal waterways
- Development of science and monitoring program
- Communication with stakeholders
- Implementation of actions

Background to the study region



Formation of the Partnership

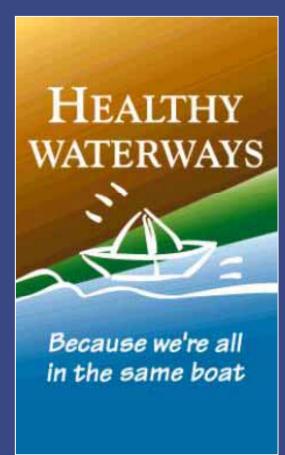


3 levels of government

- Local councils (6; 19)
- State Government agencies (6)
- plus Federal funding

Strong research support

- 3 Universities
- CSIRO
- 3 Cooperative Research Centres



Community & industry advisory groups (>40)

- indigenous
- conservation
- catchment & landcare
- commercial industry
- rural industry





















































Developing a common vision:



"South-east Queensland's catchments and waterways will, by 2020, be healthy living ecosystems supporting the livelihoods and lifestyles of people in South-east Queensland and will be managed in collaboration between community, government and industry."

Ecosystem Health Monitoring Program (EHMP)



Assess effectiveness of environmental protection measures (e.g. stormwater controls, STP upgrades, riparian vegetation)

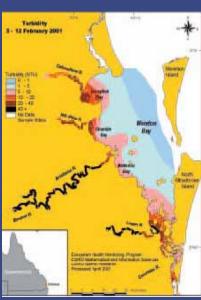


Estuarine and marine EHMP

- Designed stage 2
- Implemented Stage 3

260 sites (sampled monthly)





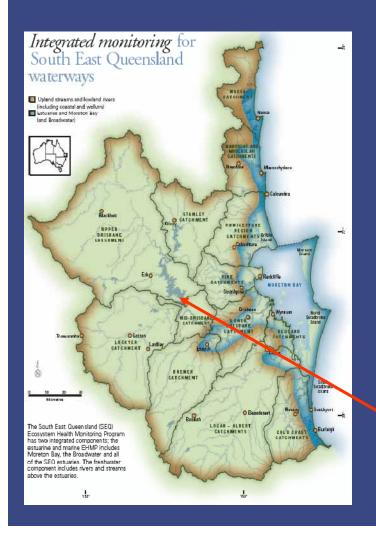


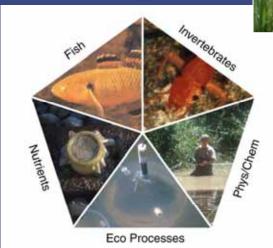
Ecosystem Health Monitoring Program (EHMP)



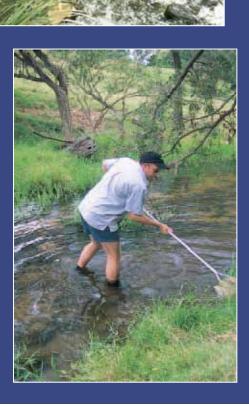
Freshwater EHMP

- Designed stage 3; Implemented 2002

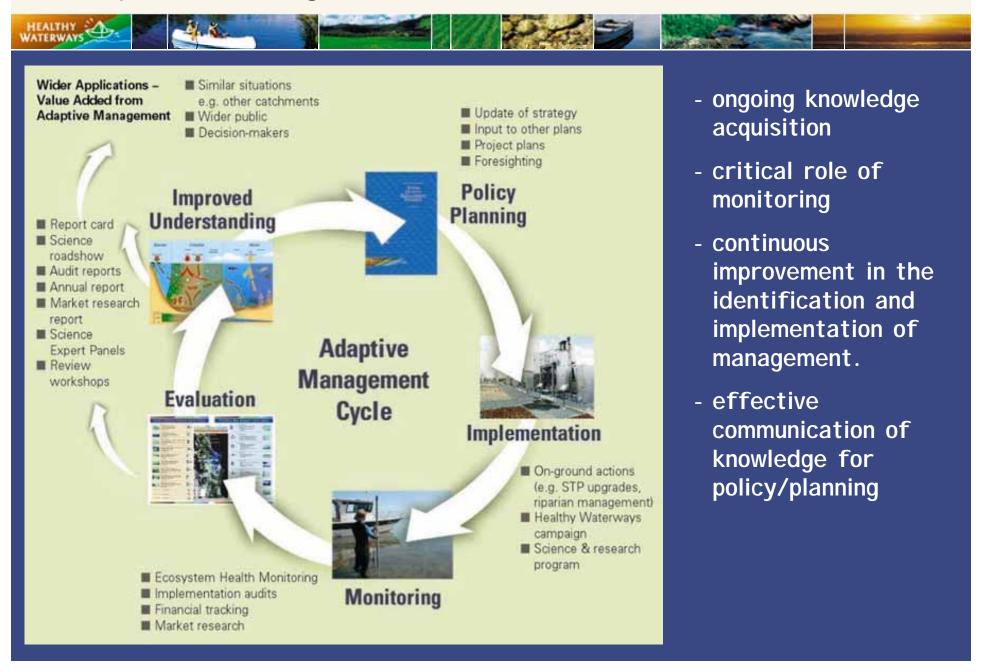




120 freshwater sites (sampled 2x/yr)

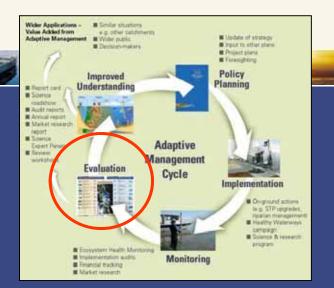


Adaptive management framework



Report cards on progress





EcosystemHealth

A comprehensive medicining program.

The Enterprise has been payen of their orders as injuried assessment of exception fraction for the colors as injuried assessment of exception fraction for the colors and of their field Consenders. Day to the "processes in color of their Consenders, the program targets bett September 1999, the colors for the colors of their colo

A particularly approach.

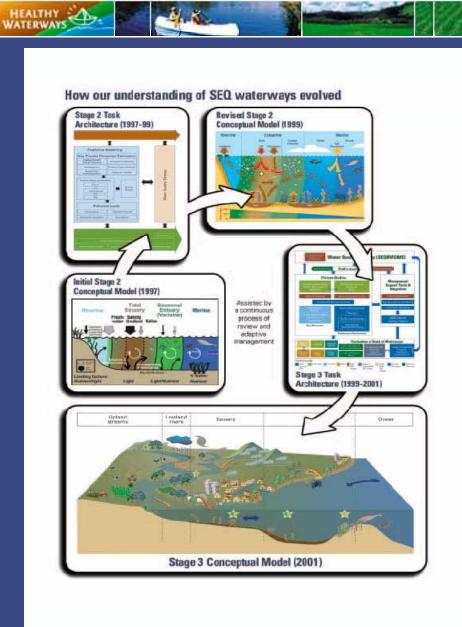
A particular payment in magazine in equate by the 10 size. Somewheat and other statistication in Door 10 size. Somewheat and other statistication in Door 10 size. Somewheat and other statistication in Door 10 size. Somewheat and other statistics and somewheat of equations and other statistics. Somewheat is sufficient to the statistics and it is expected to exceeding by the billionist Door 10 statistics and it is expected. In the statistic of the window of the statistics and it is expected by a statistic payment of expectation. Somewheat Somewheat Particular Source and Somewheat Source and Sourc

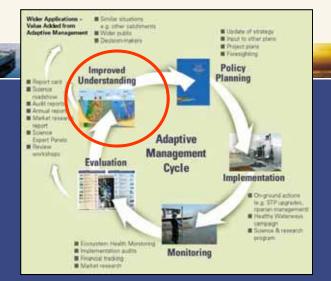
The Shift region or regions encoupled hards com-tion, which per lie used to provide long-term Switch com-tion, which per lie used to provide long-term Switches and the shift face of congregation actions understood to present Switch Rand Guernalines (sections), instead under the shift Rand Guernalines (sections), instead of the property of the state of the shift of the shift of the property of the shift of the Switchesting of the shift of express of the same of the Switchest of the shift of th

otion, and it considered one of the land comprehensive manner extensive and hardware acceptant health months ing programs in Australia.

Freshwater Report Card 2004 Estuarine and Marine Report Card 2004 Combued high inergenic subtletts in useer reacher Legend Massify Siver % Continued books If the nutient looking and loved paints over in upon market Manhoop Ster Since whereworks but deposed riperior nation Permanent Recogn | If General and note such with power require the pourtern page NO No Grade Delivery Day If Jan dissilate trigger and high numbers in upper resch Burtle Sec States Short Laubener There and chance generally be good complete with a signi-tic time in goods from and one entitlement with from one proprior month in the health of Cattage for Cost Cannot Say Topics Deal D Trigo subseries and Salvania dos absolved angel (Salva Salva) Deplet overlied system health stronger out with ninimal occur-ance of singue. Martinity poor would access major indications of hyanith for Storing 2000 to provide Auditor a decision or greate for most application from a C facil year to a Dire Storinger. Deserce property in the condi-tion and result actions a higher using in the absence of development property a banks in fair resort # Development and two O females. Cogni Flori From Ster. Services high number leafs but reduced from provide more O Restable # Soul wer out?" with here expen-needs in thought If for furing except source ourses being W mys summers and low dissolved oxygen levels No sater quelter monghair Secretar 6 # Pole or over male Sumantiés Greek Good water quality and import netwel hebites

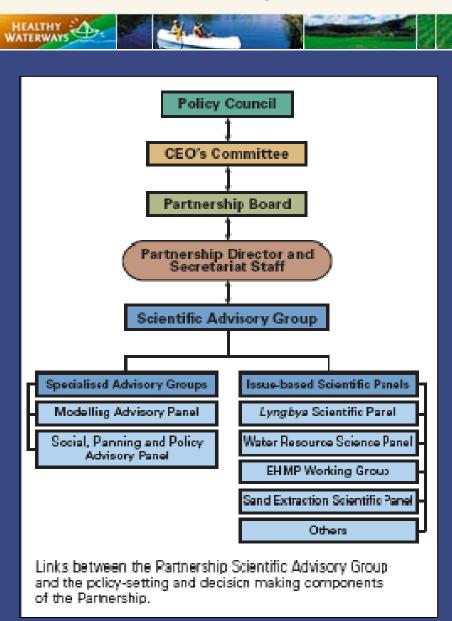
Improvement of understanding

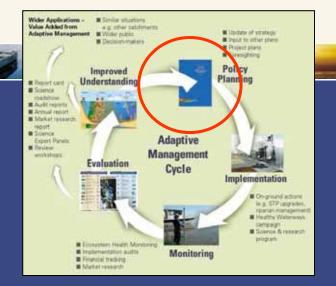




Continual refinement and testing of conceptual models

Links to policy





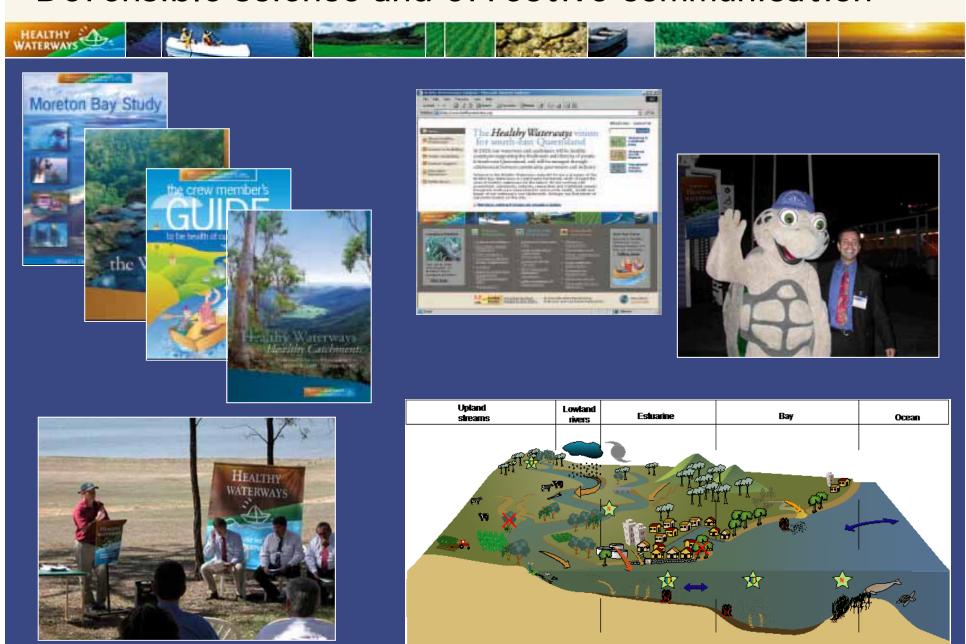
Strong link between science and policy makers



Summary - Key lessons



Defensible science and effective communication



Examples of Recovery Evaluation Objectives in the Western U.S.

Delta Stewardship Council

Presentation by the Independent Consultant



January 27, 2011



Lower Columbia River Recovery and Subbasin Plan (1991-present)

- Science based objectives linked to restoration actions
- NOAA Viable Salmonid Population (VSP) framework for recovery objectives and status assessments
- Salmon/Steelhead Population Attributes abundance, productivity, and viability

• Plan includes specific strategies, measures, and actions



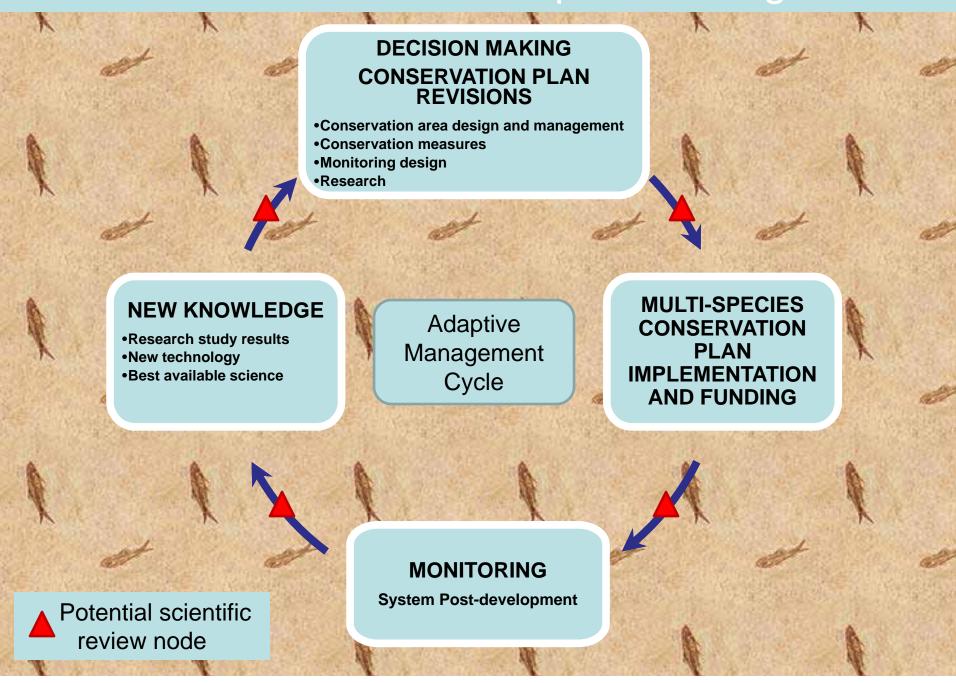
 Restoring juvenile and adult passage at barriers

Restoring estuary, floodplain, and riparian habitats

 Managing forests to protect and restore watershed processes

 Addressing immediate risks with short term habitat fixes

Lower Columbia River Adaptive Management



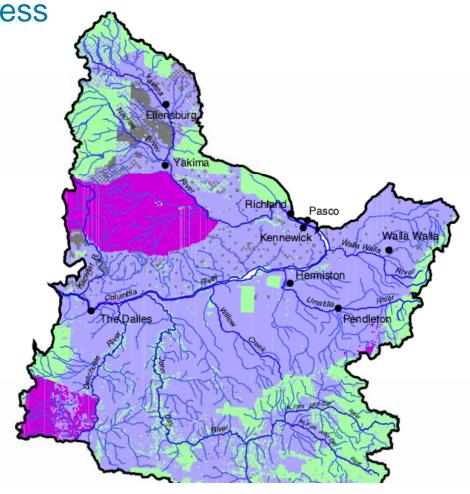
Lower Columbia River Recovery and Subbasin Plan - Monitoring

Regional agencies monitor two aspects of performance:

Programmatic performance measures - used to track

implementation and effectiveness

 Biological and environmental performance measures used to track and evaluate restoration actions, to evaluate effectiveness and reduce uncertainty



Lower Columbia River Recovery and Subbasin Plan - Monitoring

Biological status monitoring

Population parameters
 (distribution, abundance, productivity, and diversity)

Habitat status monitoring

Habitat type, extent, quality and use

Action effectiveness monitoring

 Monitors performance of management actions (measures response vs. intended effect)

Implementation and compliance monitoring

Monitors actions implemented

Specific Evaluations Supporting Ecosystem Recovery Objectives

- Extent and quality of habitat
 Do habitats exhibit the ecological functions to support salmon recovery?
- Current fish use
 Are fish using those habitats?
- Protection of critical habitats
 Are there effective protection programs ?
- Habitat acquisition programs
 Is there enough existing habitat to support species recovery?
- Water quantity and timing of in-stream flows Are water flows sufficient in the streams and rivers?
- Water quality
 Is the water contaminated ?

Puget Sound Salmon Recovery Program

Vision

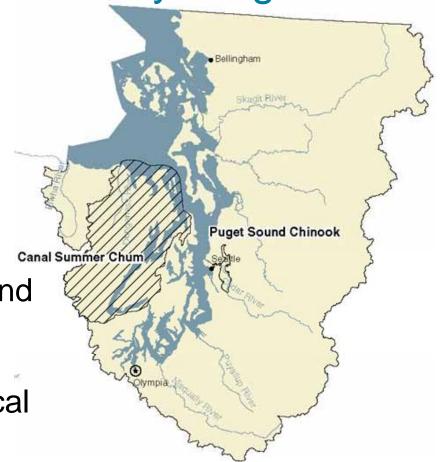
 Watershed based strategy supporting long-term functional ecosystem recovery, population viability, and stewardship

Goals and Objectives

Protect and restore nearshore and marine ecosystem processes

 Measure the viability of salmon populations and supporting critical habitats

- Develop strategies and actions to accomplish recovery
- Design regulatory programs to support protection of functioning habitats and processes



Puget Sound Recovery Program Habitat Specific Monitoring Needs



Lower Colorado River Multi-Species Planning

Terrestrial species objectives

- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages for each species

Aquatic species objectives

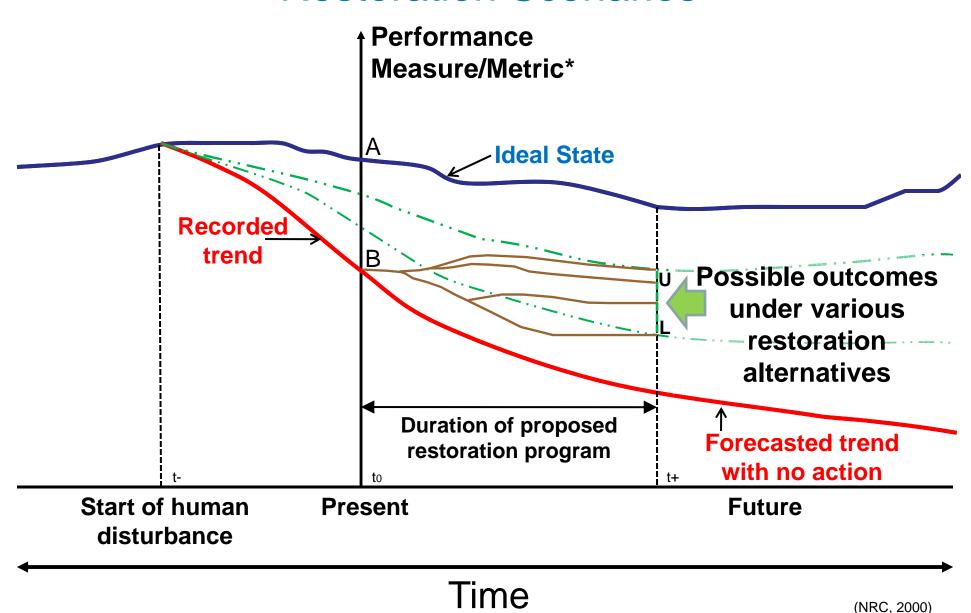
- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages and release target number of hatchery reared juvenile fish

Avian and botanical species objectives

- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages for covered species



Projecting and Assessing Performance of Restoration Scenarios



Guiding Principles for Estuary Restoration

- Protect first restore second
- > Do no harm
- > Use natural processes to restore/maintain structure
- ➤ Incorporate fish life history
- Re-establish ecosystem connectivity and complexity
- Use history as a guide, but recognize irreversible change
- Establish performance criteria based on objectives and monitor
- Use best available science and employ a scientific peer-review process

(Simenstad and Bottom 2002)

Desirable Delta Habitat Conditions

	Ecosystem Component	Action
1	Internal tidally mixed Delta flows	Create upstream-downstream mixing without cross Delta flows
2	Slough networks	Create natural drainage systems for marsh habitats
3	River inflows	Develop fish-friendly flow regime
4	Tidal marsh	Expand tidal marsh throughout Delta and Suisun Marsh
5	Open water	Flood subsided islands in the Delta and diked marshlands in Suisun Marsh
6	Variable salinity	Manipulate hydrodynamic regime where possible
7	Native species abundance	Take species-specific actions
8	Activated floodplains	Expand floodplain habitat and increase frequency of flooding
9	Water quality	Reduce inputs of urban/agricultural pollutants
10 (Mo	Cooler summer habitats byle et al. 2010)	Expand tidal marshes in areas with cooler water temperatures